Health Assessment for

BURLINGTON NORTHERN SOMERS TIE TREATING PLANT NPL SITE

SOMERS, MONTANA

CERCLIS No. MTD053038386

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

cc: McGuire
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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

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Agency for Toxic Substances
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APR 17 1989

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ENVIRONMENTAL PROTECTION
AGENCY
APR 25 1989
MONTANA OFFICE

Dear Mr. Geise:

Enclosed are three copies of the completed Health Assessment on the following site prepared by the Office of Health Assessment, ATSDR:

Burlington Northern Somers Tie Treating Plant NPL Site

We have received and taken into account your comments on the draft document previously sent to your Regional Office. We very much appreciate your comments and look forward to working with you and your staff in the future.

Sincerely yours,

Stephen D. Von Allmen
Assistant Director for Health
Assessment Coordination
Office of Health Assessment

SUMMARY

The Burlington Northern Somers Tie Treating Plant NPL site is located near Flathead Lake in Somers, Montana. Zinc chloride, chromated zinc chloride, and creosote were used for wood treatment. The contaminants of most concern at the site are polynuclear aromatic hydrocarbons (PAHs), benzene, arsenic, cadmium, chromium, and lead. The site is on the edge of town, and a number of residences are located adjacent to the plant and across Somers Road. Area residents are connected to the public water supply which is currently obtained from the lake; however, Somers School uses well water for potable purposes, and some residents continue to use well water for other purposes. The Somers Water District is planning to install bedrock water-supply wells in 1989 and discontinue the community's reliance on lake water. Contaminants are present in the soil, an inactive pond (CERCLA pond), and groundwater on the property. There has been some contaminant migration off the property in groundwater and into the lake and possibly into the air and soil on adjacent properties. The lateral extent of migration is not fully documented. Exposures to contaminants in the school well water and domestic well water and to contaminants in the municipal water supply are unlikely to pose a public health threat at the concentrations recorded. However, contamination levels at and near the site may be great enough in some of the environmental media to pose a potential threat to human health.

BACKGROUND

A. SITE DESCRIPTION

The Burlington Northern Tie Treating site is a former wood treatment plant located on the northern outskirts of Somers, Montana, which is seven miles south of Kalispell. The property has been used for wood treatment from the turn of the century until operations terminated in 1986.

The site is adjacent to the northwestern shore of Flathead Lake which is approximately 5 miles wide by 25 miles long. A large landlocked slough adjoins the plant area on the north. The site consists of two large elongated parcels that are oriented generally northwest to southeast. One parcel is the plant area northwest of Somers Road. The second parcel is owned by a company subsidiary and extends from Somers Road to the lake. The combined properties are considered to be the facility site for purposes of this Health Assessment.

Zinc chloride, chromated zinc chloride, and creosote with petroleum were used for wood treatment. Contaminants are believed to have been released at the plant location principally from wastewater treatment, sludge storage, and drippage from the treated wood. Treatment waste contaminants were identified at the plant location in two RCRA (Resource Conservation and Recovery Act)-regulated ponds that are now closed, in soils along railroad tracks and tie storage areas, and at an abandoned CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) pond that is inactive. On the subsidiary's property; contaminants have been identified in a 1500-foot discharge ditch leading from the CERCLA pond to the lake, and in what was once a shallow depression (swamp pond) near the lakeshore in which some treatment wastes accumulated. A portion of the swamp pond appears to extend off the facility site. The CERCLA pond and ditch system were abandoned in 1971. At that time, two wastewater recycling ponds were installed at the plant location. These were later designated RCRA-regulated ponds and were closed under RCRA in 1987 and 1988. A fence has been erected at the plant location around the CERCLA pond and treatment equipment. The subsidiary's property across the road is partially fenced.

Under an administrative order signed in 1985, the company removed some contaminated soil, sludge, and liquids from the swamp pond area and from a portion (60,000-sq. ft. area) of the discharge ditch. The excavation limits were based on visual criteria. Sampling and analysis, after the removal, indicated some residual materials had significant contaminant levels. The swamp pond excavation was backfilled with clean soil, and a gravel layer was placed over the surface. Flathead lake shoreline at the edge of the swamp was blanketed with rock to reduce erosion of contaminated materials. Also, wastes were removed from the RCRA ponds at the plant, and these were reconstructed as double-lined basins to hold the liquid and solid wastes removed from the swamp pond. Wastes have since been removed from the basins. Liquid wastes from the removal operation were processed in the plant's treatment system, and solids were transferred off-site to a RCRA unit at another of the company's production facilities.

The site has been placed on the National Priorities List, and this Health Assessment is developed in connection with a forthcoming EPA (U. S. Environmental Protection Agency) Record of Decision (ROD) for the site. Draft Remedial Investigation, Feasibility Study, and Risk Assessment reports were submitted by the company to EPA; and supplemental investigation information were developed. A revised Remedial Investigation and Feasibility Study report was submitted in December 1988.

B. SITE VISIT

A site visit was not considered necessary for the purpose of preparing this Health Assessment.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

Monitoring results for on-site contaminants of potential concern to public health are summarized in Table 1 in the Appendices. The summary data illustrate that wastes in the CERCLA pond have high concentrations of metals and organic compounds, especially PAHs. The data also show that contaminants have been released to the on-site soils and groundwater. All soil and groundwater contaminants recorded in the table exceed background levels. The values for subsurface soils represent conditions at and below a depth of about two feet. Reference information includes some monitoring data for surficial soils; two surficial samples were obtained beyond the CERCLA pond in the vicinity of residential gardens (along Somers Road) and one surface sample was taken in the plant area. From this information, it appears that these samples might not represent locations where surface soil contaminant concentrations are likely to be greatest, such as at waste management units, drip tracks, and where wood was treated, handled, and stored.

Air monitoring data was obtained by the Montana Department of Health and Environmental Sciences in 1985 while the plant was in operation to evaluate compliance with work-place standards. This information is not presented or considered in this Health Assessment because the plant has since been closed, and the data would not represent current ambient air contaminant levels.

B. OFF-SITE CONTAMINATION

Monitoring results for off-site contaminants of potential health concern are summarized in Table 2 in the Appendices. The off-site soil and groundwater monitoring data were obtained at a few sampling points near the site boundary. Contaminant information is provided for the nearest water supply wells in the area, surface waters, and the public water supply. One of the wells is located within the Somers School property. Information also is given for sediments in surface waters. The results of fish tissue analyses also are provided.

Off-site groundwater monitoring conducted at locations close to the site boundary revealed metals concentrations of potential concern and low concentrations of PAHs. Analyses of samples from area water supply wells indicate low levels of metals and PAHs that exceed background values. Lake water and the municipal water supply was sampled at numerous locations. Most metals and PAHs were present above background levels. Background for water supply wells has been considered to be at the Boone residence which is serviced by spring water collected in a cistern. Background for lake/municipal water has been considered to be Station F in the lake, located south of the site about one and one-half miles offshore.

Off-site soils contain arsenic at concentrations that do not exceed background values, and they have PAHs that exceed background but are at low levels. Arsenic also is found in slough, shoreline, and lake sediments. Analyses of slough sediments and water showed elevated levels of zinc. PAHs are reported in slough sediments and in the shoreline sediments close to the swamp pond.

C. PHYSICAL HAZARDS

With the RCRA ponds remediated and access to the CERCLA pond restricted, there do not appear to be potential physical hazards on the property.

DEMOGRAPHICS

The plant site is in Somers, an unincorporated town having a population of about 1200. Most of the town is to the south of the site. Residences exist adjacent to the plant property at the northeast and southeast boundries, and they also are present to the east immediately across Somers Road. Residents near the site are served by public water withdrawn from Flathead Lake. However, the Somers School and some residents in the area still use groundwater for drinking or for washing, cooking, or irrigation.

EVALUATION

A. SITE CHARACTERIZATION (DATA NEEDS AND EVALUATION)

1. Environmental Media

Comprehensive information was not available for all environmental media. In general, the data provided indicate either known contamination or a potential for contamination of all media. However, more information is needed concerning the magnitude and extent of contamination for comprehensive evaluation of potential on-site and off-site exposure.

Air quality information is needed to evaluate current human exposure via inhalation of contaminants. Data regarding concentrations in the ambient air at potentially significant source points (i.e., ponds, wood treatment area, drip tracks/storage areas) would not only help determine if there is a potential threat to trespassers and area residents but also would indicate what health and safety precautions may be needed by on-site investigators and workers during any proposed remediation. Reference information describes air modeling conducted while the plant was operational and presents results for points 100 meters (and farther) from the source. Based on reference maps, the nearest residential receptors appear to be closer than 100 meters from the CERCLA pond and treatment area.

Sampling of subsurface soils on the property indicates that there are contaminants of potential concern to intruders or workers. Sampling of surficial materials needs to be included to include more information about contaminants around waste management units and wherever treated wood was handled and stored to define the character and lateral extent of contamination. The ongoing investigation, which includes surface soils in the CERCLA pond area is nearing completion.

Monitoring has identified the presence of contaminants in groundwater at the property. Continuing data collection is needed from the monitoring wells to better define the extent of contamination and to characterize its rate and directions of movement. Additional monitoring wells may be needed beyond the slough to define flow direction, and especially the extent of flow reversals during periods of elevated lake levels.

Contaminants of the kind released from the property are found at low levels in the public water supply (surface water) and water supply wells (groundwater). It is appropriate to conduct continuing monitoring of the public water supply and pertinent water wells in the area.

2. Demographics and Land Use

Land use and demographics have been adequately characterized.

3. Quality Control and Quality Assurance

Review of quality control information provided in references indicates that the laboratory work covered by the documentation was of acceptable quality.

B. ENVIRONMENTAL PATHWAYS

Soil, groundwater, surface water, sediment, air, and food chain pathways are of concern at this facility. However, the air pathway cannot be evaluated fully because pertinent air quality information is not available.

Soils

On-site soil contaminant levels are greatest at the CERCLA pond and along the railroad track where treatment chemicals have dripped from wood products onto the surface soils. Measurable contamination also probably occurs wherever treated ties were handled and stored. The contaminant levels for surface soils shown in Table 1 probably are understated because the locations of these samples do not appear to represent areas of potentially severe contamination. Thus, maximum surface soil contamination on-site is probably better represented by the levels listed for the CERCLA pond materials. The surface soil values shown in Table 1 reflect conditions near some residences east of the CERCLA pond, and one location in the plant area. At the swamp pond and ditch area, materials left in place after the emergency removal also have substantial contaminant levels.

Soil is an important pathway because contaminants occur at the ground surface and at depth. Some of the contaminants can be leached from soil and transported with groundwater to where it discharges (i.e., slough, lake) or where it possibly is withdrawn by water supply wells.

Rainfall runon and runoff erodes surficial soil and contaminants in the plant area and in the ditch and swamp pond area. These chemicals are transported to the slough and Flathead Lake. Air currents periodically erode surface contaminants and redeposit them on-site and off-site. Volatilized contaminants are similarly transported.

Vehicles entering the property may trackout significant concentrations of contaminants onto area streets. Further remedial measures or development activities may expose contaminants presently below ground surface to transport by runoff or air currents.

Groundwater

Known groundwater contamination on-site is greatest in the vicinity of the CERCLA pond and the swamp pond area. Off-site, the greatest contamination appears to be in the vicinity of the swamp pond.
Water supply wells in the immediate area (e.g., Somers School well, private wells) have low concentrations of some of the same contaminants being released at the site. Groundwater is likely to discharge contaminants to nearby surface waters. Public water supply currently is withdrawn from Flathead lake, but the community plans to convert to a groundwater supply.

Hydrogeologic data indicate there are three aquifers in the vicinity of the site. The first is a shallow water table aquifer comprised of sandy/silty soils. This upper zone usually is underlain by a confined artesian soil/gravel aquifer. A third aquifer occurs within the underlying bedrock. Local wells, still in use, draw from soil and bedrock aquifers.

Reference documents have not fully defined the character and extent of groundwater and entrained contaminant movement in the site area. The overall groundwater gradient trends to the southeast, toward Flathead Lake. However, reference information indicates groundwater (and entrained contaminant) movement in the site area is not entirely toward the lake. Monitoring data suggest that shallow groundwater on both sides of the slough near the plant location flows into the slough. Also, during the months that the lake level is high, monitoring data indicate that a temporary flow reversal (i.e., flow from the lake to the north) occurs but the available date suggest that the reversal may be limited to the area between the plant and lake. Therefore, contaminants noted in water supply wells farther inland from the plant might not be the result of site releases.

Water supply wells in the area typically are screened in the water table aquifer or in an underlying artesian aquifer. However, a well at Somers School withdraws from a bedrock formation which underlies the water table and artesian aquifers. Monitoring data obtained for the Somers School well, three private water supply wells, and a cistern that is supplied by a spring show that water in the wells has low levels of organic and inorganic contaminants. There were no contaminants above detection limits in the cistern water. The Somers School well is used for drinking water. Water from the other three wells and the cistern may be used for washing, cooking, or irrigation. The cistern and three of the wells, including the one at Somers School, are located 1000 to 2500 feet to the north or northeast of the site. Since the lake's seasonal influence on reversing groundwater flow gradients may not extend further inland than the plant area, the contaminants noted in the three wells might not be related to the site. The fourth water supply well in which contaminants were detected is located south of the site and is screened in bedrock. Since contaminants tend to occur within the shallower water zones, it is possible that contaminants detected within the bedrock aquifer at this well location may not be related to the site.

Contaminated groundwater in the vicinity of the swamp pond possibly discharges into the lake without encroaching on any known water supply wells.

Surface Water

The inactive RCRA ponds were designed for zero discharge (via evaporation) and were later double-lined as part of the removal activities. Therefore, there has been no known wastewater discharge to surface waters, but there possibly has been contaminant movement to groundwater from storage. The CERCLA pond has discharged effluent through the ditch to the swamp pond and the lake, but there currently are no releases. The CERCLA pond continues to release contaminants to groundwater from the materials remaining in place. Runoff that enters the discharge ditch and swamp pond area probably becomes contaminated because of the contaminated soil and sediment that remain at these locations. This water, along with contaminated groundwater, emerges at the lake where it becomes diluted.

Topography suggests that the landlocked slough to the north of the plant has received significant runoff from the site and from treated wood which has been stored along its shoreline. This runoff water along with contaminants in the sediments probably has caused contaminant levels in slough water to be elevated at times. Some of this contamination is likely to be released to the groundwater.

Lake water monitoring discloses that some contaminants like those released from the site occur at low levels near the property and also near the public water intake. Monitoring of the public water supply also revealed low levels of these contaminants.

Sediment

Monitoring indicates sediments (and soils) in the ditch/swamp pond area have site-related contaminants. The area that was excavated to remove contaminants received a cover layer of gravel. However, the lateral limits for removal were determined by visual inspection, and tests indicate that some unexcavated materials are contaminated. A rock breakwater also has been constructed along the shoreline in front of the swamp pond. Prior to breakwater construction, contaminated sediments were transported by the ditch or eroded by waves and released into the lake where they were deposited and/or transported farther by water movement. With the breakwater in place the rate of contaminated sediment deposition should be less than it had been. Contaminated sediments also occur in the slough.

Air

Organic chemicals in the soils and ponds may volatilize, and particulate contaminants might be eroded by wind or be physically dislodged by future remediation or development activities. Future remedial or development activities probably would increase the volatilization rate of freshly exposed organic chemicals. These airborne contaminants possibly could migrate to adjacent properties.

Food Chain

Tissue analyses of fish indicated that they contained concentrations of metals, but PAHs were not found above detection limits. Waterfowl and fish inhabiting the lake or slough are exposed to contaminants and possibly convey them through the food chain. An oxygen deficiency reported to exist in slough water may not allow fish populations to develop in the slough, but waterfowl are likely to nest there. Cattle grazing in the area possibly take up contaminants and pass them on through the food chain. Produce from residential gardens also may be a pathway for contaminants taken up from soil or shallow groundwater, or deposited by wind currents.

C. HUMAN EXPOSURE PATHWAYS

There are potential human exposures on-site and off-site for all media. Table 3 in the Appendices summarizes the potential human exposure points and the exposure routes believed to be of concern as a result of site releases. Pathways evaluations reflect some uncertainty about future site development and consider the surrounding area to continue residential and open land.

PUBLIC HEALTH IMPLICATIONS

The Burlington Northern site in its current state of contamination poses a potential public health threat. The contaminants of concern at this site are carcinogenic and non-carcinogenic PAHs, benzene, and several inorganic compounds including arsenic, cadmium, chromium and lead. The carcinogenic PAHs include benzo(a)pyrene, benzofluoranthene and chrysene. Naphthalene, acenaphthene, pyrene and fluoranthene are among the non-carcinogenic PAHs.

On-Site Contamination

Groundwater

Long-term ingestion of on-site groundwater contaminated with arsenic, cadmium, chromium, lead, and benzene, at levels mentioned in Table 1, may result in marked carcinogenic and non-carcinogenic adverse health effects. The levels of non-carcinogenic PAHs found in the on-site groundwater do not pose a health concern at present. Carcinogenic PAHs were not detected in on-site groundwater. At present there are no known human receptors of on-site groundwater.

CERCLA Waste Pond

It was reported that access to the CERCLA pond would be difficult since the pond itself is fenced. However, it was also reported that children are living 30-60 feet from the pond (across Somers Road). ATSDR was not provided with documentation of the information which addresses the accessibility of the CERCLA pond, and the proximity of residences to this pond. Therefore, at present, exposure to contaminants present in the CERCLA pond remains a possibility. Exposure to on-site soil contaminants through contaminated waterfowl will be discussed in the off-site contamination section.

Populations potentially exposed to waste present in the CERCLA pond include trespassers (i.e. children), remedial workers, and consumers of potentially contaminated waterfowl. Trespassers may be exposed through ingestion, inhalation and dermal contact to levels of arsenic, carcinogenic and non-carcinogenic PAHs which may lead to adverse health effects including an unacceptable excess lifetime cancer risk. Remedial workers may be cumulatively exposed to higher levels of contaminants since waste-and-soil-disturbing activities may lead to an increase of these contaminants in the ambient air. Adequate personal protective equipment should minimize these potential exposures to the workers.

Arsenic

Exposure to the levels of arsenic present in the CERCLA pond may result in adverse health effects. Chronic oral exposure to elevated levels of arsenic may result in peripheral neuropathy and increase the risk for skin cancer. Arsenic induced neuropathy is classified as a distal axonopathy

with axonal degeneration, especially of large myelinated fibers (Hindmarsh and McCurdy, 1986). Squamous and basal cell carcinomas are the most common malignant lesions. Most of the potential non-carcinogenic adverse health effects were found following exposure to much higher levels of arsenic than are currently associated with the Burlington Northern site.

Carcinogenic PAHs

Human exposure to individual PAHs in the environment occurs seldom, if ever. More commonly, humans are exposed to individual PAHs such as benzo(a)pyrene as a component of complex mixtures of PAHs and other chemicals. Interactions between mixture components are likely to occur. In particular, interactions may play a large part in carcinogenesis resulting from exposure to PAHs. Cancer is the best studied endpoint of intermediate and long-term toxicity induced by this group of PAHs and the one which has been shown to be most sensitive in the work done to date. Human exposure to complex mixtures of PAHs by ingestion, inhalation and dermal contact has been well documented in many places.

The carcinogenic PAHs present at this site are all genotoxicants and are components of mixtures shown to have caused pulmonary and dermal cancer. Human tumorigenicity has also been reported to result from exposure to creosote. Most of these studies were performed on workers who engaged in activities such as dipping timber in creosote. These workers were reported to have developed malignant and pre-malignant lesions of the face, arms, and scrotum (Lenson, 1956). Many of the individual PAH components of creosote have been shown to be both mutagenic and carcinogenic in laboratory bioassays, supporting the evidence of their human carcinogenicity (IARC, 1983).

The potential cancer risk which may result from exposure to the mixture of carcinogenic PAHs associated with the Burlington Northern Site is evaluated on the basis of the carcinogenic potential of one of its components, namely benzo(a)pyrene. Predicting the toxicity of a complex mixture based on one or several of its components may be misleading because of the possibility of interactions among the components which may modify toxicity. This interaction is pronounced in the area of metabolic enzyme activation (among others), potentially resulting in both synergistic and antagonistic effects on mutagenicity (Hass et al., 1981). Interactions can thus play important modulating roles in PAH toxicity that may not be adequately reflected in the identification of significant human exposure.

Non-Carcinogenic PAHs

The most important known adverse health effect following exposure to non-carcinogenic PAHs is hemolysis. Although hemolysis has been specifically reported in individuals with a deficiency in the glucose-6-phoshate dehydrogenase (G-6-P-D) activity of red blood cells, this effect would also be expected with other less common erythrocyte

enzyme deficiencies. There are little data available on the dose-response levels associated with this hemolytic syndrome. Sollman (1957) reported that 2 grams (80 mg/kg) of naphthalene over a two-day period was lethal in a six-year-old child. The maximal level of naphthalene present in the waste of the CERCLA pond is 500,000 mg/kg, which would correspond with approximately 16% of the lethal dose (compared with Sollman's data.) Exposure to this dose may result in potential hemolytic effects particularly in susceptible individuals. Also, dermal exposure to several non-carcinogenic PAHs at this dose can cause phototoxicity. Possible skin and eye effects may include erythema and swelling, followed by hyperpigmentation, and keratoconjunctivitis (Casarett and Doull, 1986.)

On-Site Soil

For this Health Assessment, on-site soil data were only provided for subsurface soil and the near-surface soil from the swamp pond and ditch area. Ongoing investigation of surface soils near the CERCLA pond is nearing completion.

On-Site Subsurface Soil

Workers conducting remedial activities may be exposed to the contaminants present in the surface and subsurface soil. Although exposure to the levels of inorganic compounds present in the subsurface soil may not pose a health concern by themselves, a full assessment of potential adverse health effects resulting from exposure to all on-site soil contaminants can not be performed since subsurface soil data has limited use. Moreover, reference documents list individual PAHs concentrations for some subsurface soil samples, and list only total PAHs for others. When only total PAHs are known, no distinction can be made between carcinogenic and non-carcinogenic PAHs.

Near-Surface Soil: Swamp Pond and Ditch Area

Populations at risk of exposure include trespassers and remedial workers. Also, although this area is partially fenced; it can be entered from the beach, and since this area is used for horse grazing, horse owner(s) enter this portion of the site frequently. The horses are used for recreational purposes only. It was reported that since 1986 cattle grazing was discontinued in this area. ATSDR was not provided with documentation of the information concerning the discontinuation of cattle grazing near the Swamp pond and Ditch area since 1986. Analysis of the near-surface soil of the swamp pond and ditch area was only performed for PAHs (Inorganic analysis was not conducted on samples obtained from the upper five feet in the soil column). Exposure to the levels of carcinogenic PAHs present in this portion of the site may lead to an unacceptable excess lifetime cancer risk. The levels of non-carcinogenic PAHs are unlikely to pose a major health concern.

Off-Site Contamination

Off-Site Groundwater: Monitoring Wells

Off-site groundwater obtained from the monitoring wells sampled (Table 2) is contaminated with arsenic, chromium and lead at levels which may pose a potential health threat if this water was consumed on a long-term basis. Of the PAHs, only those with non-carcinogenic properties were detected. The levels of these non-carcinogenic PAHs in the off-site groundwater monitoring wells are not likely to pose a health concern. At present there are no known human receptors to off-site groundwater obtained from these monitoring wells.

Off-Site Groundwater: Private Drinking Water Wells

The only well reported to be currently in use as a potable water source is that of the Somers School, an elementary school located north of the site. Exposure to the levels of inorganics and PAHs currently present in the school well are not likely to pose a health concern. ATSDR was not provided with other information concerning the school, such as the size and ages of the potentially exposed school population.

Based on the reported levels of contaminants in the rest of the private wells that were monitored, long-term exposure to the groundwater obtained from these wells is unlikely to pose a health concern at present. Water from these wells is currently used for irrigation, cooking, or bathing.

Flathead Lake Water

Potentially exposed populations are individuals engaged in recreational activities (fishermen, hunters, tourists). Using the most reliable data set (April 1987) on Flathead Lake, exposure to water from the lake through ingestion, inhalation and dermal contact is unlikely to pose a health concern at present. According to the Remedial Investigation report, the carcinogenic PAHs detected in some of the lake samples possibly are attributable to an external source, since these PAHs were also detected in the respective shipping blank samples. Exposure to the levels of inorganic constituents and non-carcinogenic PAHs detected is unlikely to pose a health concern.

Municipal Water Supply

Based on the data presented in Table 2, long-term ingestion, inhalation and dermal contact with the municipal water supply obtained from Flathead Lake is not likely to pose a health concern. Lead (11 ppb) was only detected in a sample from the pump house. The four residential taps tested did not reveal any lead or other contaminants at levels which cause adverse health effects.

Off-Site Subsurface Soil

Exposure to the levels of contaminants present in the off-site subsurface soil is unlikely to pose a health concern. These samples were obtained during the construction of monitoring well s-85-5b and s-85-6b located in the slough north of the site, and in the swamp near the lake, respectively. At present there is no potential population at risk of exposure to off-site subsurface soil.

Slough

Based on the reported levels of contaminants present in the slough water (table 2), exposure to the slough water is not a current health concern. Depending on the frequency and duration of exposure, and type of recreational activities associated with the slough, exposure to the slough sediment through ingestion and dermal contact may pose a health concern. Specifically, exposure to the levels of carcinogenic PAHs may lead to an excess lifetime cancer risk.

Sediments: Flathead Lake, Shoreline

Depending on the frequency and duration of exposure, the level of carcinogenic PAHs present in the beach sediments may be a potential health concern in the same manner as the slough sediment.

Food Chain Contamination

Potentially contaminated food sources associated with the Burlington Northern Site, which may result in food chain contamination are:

- consumable fish from Flathead Lake;
- local waterfowl;
- vegetables grown on potentially contaminated off-site surface soil;
- locally grazing dairy cattle;
- local consumable wild plants.

Fish from Flathead Lake

Specimens (10 of each) of 2 consumable fish species (Dolly Varden, Whitefish) present in the lake were analyzed for PAHs and inorganic compounds (Table 2). The levels of contaminants currently present in the fish fillets of both species may not pose a health concern if the fillets were to be consumed. However, depending on information obtained on the local food consumption pattern, analysis of other consumable species of fish and aquatic organisms present in the lake may be needed to adequately assess food chain contamination through consumption of fish caught in Flathead Lake.

Local Waterfowl

Local waterfowl may bioaccumulate contaminants present in the sediments from the WPA, shoreline, and slough and CERCLA pond. In 1988, a waterfowl investigation was conducted. The investigation included an analysis of nest size and hatchability of eggs, and zinc tissue concentrations. In addition, adult waterfowl were observed over a 3.5 month period for mostly feeding and loafing behavior.

Analysis of the above mentioned parameters indicated that no adverse impact to the waterfowl population could be attributed to the levels of zinc in the site slough (ref). The inadequacies in the Qa/Qc methodology of the waterfowl tissue sampling analysis may not have influenced the determination whether or not elevated zinc levels in the site slough could adversely impact the waterfowl population. However, the sampling results may not be representative of the true tissue zinc levels. In addition to information on the local consumption pattern, accurate concentrations of zinc in waterfowl tissue are needed to adequately assess the public health implications associated with consumption of these waterfowl.

Off-Site Vegetables

Residential vegetable gardens are located directly across Somers Road, approximately 30-60 feet from the CERCLA pond. In May 1988, off site soil data was collected. However, no surface soil sampling was conducted in areas near the vegetable gardens (ref). Minimally, off-site surface soil data of these areas are needed to determine if consumption of vegetables from the above mentioned gardens may pose a potential health concern.

Nearby Cattle

The U.S. EPA Regional Project Manager reported concerning nearby grazing cattle to ATSDR:

> A known grazing location is a partially fenced area east of the plant which includes the ditch.
> Cattle grazing was discontinued in 1986.
> Same area is now used for horse grazing.
> Horses are used for recreational purposes only.

ATSDR was not provided with documentation of the above reported information. If this area should again be used for cattle grazing, or if consumable animals graze anywhere around the plant, then at a minimum, a food consumption survey is needed as mentioned before. This survey is needed to assess potential public health implications associated with ingestion of potentially contaminated meat or dairy products.

Sensitive Subpopulations

Sensitive subpopulations associated with the Burlington Northern Site include:

- Individuals with liver disorders including those with deficiencies of monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA), and individuals with erythrocyte deficiencies of such enzymes as G-6-P-D, pyruvate kinase, and many others;
- Individuals with disorders of the immunologic and hematopoietic systems;
- Individuals that are aryl hydrocarbon hydroxylase (AHH) inducible may have a higher susceptibility for the carcinogenic effects of high molecular PAHs (Calabrese, 1984). At present, however, this genetic susceptibility data is still regarded inconclusive.

CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This site is of potential health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Human Exposure Pathways Section, human exposure to contaminants may be occurring via all environmental media. Lake water and groundwater containing low levels of contaminants are being used by area residents. Recreational users of the lake and intruders into the swamp pond area or CERCLA pond possibly are exposed to waterborne contaminants. Exposure possibly is occurring through consumption of some food chain species. Exposure possibly occurs through contaminated soils or sediments at nearby residences, the pasture land, and swamp, and at the lake or slough. Nearby residences possibly are exposed to airborne contaminants.

B. RECOMMENDATIONS

1. In accordance with CERCLA as amended, the Burlington Northern Somers Tie Treating NPL site, Somers, Montana, has been evaluated for appropriate follow-up with respect to health effects studies. Although there are indications that human exposure to on-site contaminants may possibly have occurred, this site is not being considered for follow-up health studies at this time because no known current exposure is occurring at a level of concern.

2. Areas of the site remain accessible to area residents and transients, and access should be restricted to reduce public health concerns.

3. More extensive surficial soil sampling should be conducted on-site where wastes were managed, in the treatment area, and where treated wood was handled or stored to define the areal extent of soil contaminants that may pose a public health concern.

4. The character and lateral and vertical extent of off-site contaminated groundwater needs to be confirmed by additional monitoring, and possibly additional wells north of the slough, to better identify concerns for public health. Water-supply wells currently in use in the area should continue to be monitored.

5. Institutional controls should be implemented to prevent use of water from existing groundwater wells in the site vicinity and to prevent installation of new wells.

6. The public water supply, after treatment, should continue to be monitored.

7. Ambient air monitoring is needed at the property to evaluate public health concerns arising from volatilization and particulate transport of contaminants.

8. The well system for the proposed new public water supply should be installed in an area where it will not be affected by site releases.

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APPENDICES

Table 1 On-Site Contaminants Of Potential Concern

Table 2 Off-Site Contaminants Of Potential Concern

Table 3 Potential Human Exposure Pathways

TABLE 1

ON-SITE CONTAMINANTS OF POTENTIAL CONCERN

PARAMETER	GROUNDWATER	CERCLA POND
Arsenic	0.005 - 0.068	474 - 614
Cadmium	NA	4 - 21
Chromium	0.003 - 0.180	50 - 63
Copper	0.003 - 0.320	35 - 70
Lead	0.005 - 0.190	175 - 185
Zinc	0.02 - 49	3,490 - 4,380
Benzene	ND - 0.067	ND
PAHs (High MW)	ND	2,060 a
PAHs (Low MW)	ND - 1.79	558,000 a
PAHs (Total)	ND - 1.79	See Above

PARAMETER	SUBSURFACE SOIL	SURFACE SOIL e	NEAR-SURFACE SOIL ** SWAMP POND/DITCH AREA
Arsenic	1.2 - 32	NA	NA c
Cadmium	NA	NA	NA c
Chromium	6.4 - 123	NA	NA c
Copper	4.8 - 145	NA	NA c
Lead	3.4 - 52	NA	NA c
Zinc	29 - 12,000	225 - 3770	NA c
Benzene	NA	NA	NA c
PAHs (High MW)	ND - 78 d	ND - 16.4	470 a
PAHs (Low MW)	ND - 3000 d	0.25 - 11.9	6,758 b
PAHs (Total)	ND - 3000 d	0.25 - 28.2	0.04 - 7,228

All values are in ppm
Samples taken 1985/86/88

NA = no analysis
ND = not detected
* = only one value reported
** = residual values remaining after emergency removal
a = maximum value
b = estimated maximum value
c = analysis not conducted on samples within five feet below ground surface
d = reference documents list concentrations for individual PAH's for some samples, and list only total PAH's for others
e = 3 samples tested (1 in plant area, 2 along Sommers Road)
MW = molecular weight

TABLE 2

OFF-SITE CONTAMINANTS OF POTENTIAL CONCERN

PARAMETER	GROUNDWATER MONITOR WELLS	GROUNDWATER DRINKING WATER WELLS
Arsenic	0.007 - 0.117	ND - 0.005
Cadmium	0.009 *	NA
Chromium	0.003 - 0.240	ND
Copper	0.011 - 0.220	ND - 0.070
Lead	0.005 - 0.550	ND - 0.009
Zinc	0.034 - 44	0.04 - 1.20
Benzene	NA	NA
PAHs (High MW)	ND	ND - 3.5 E-6
PAHs (Low MW)	ND - 18	ND - 4.0 E-5
PAHs (Total)	See Above	See Above

PARAMETER	LAKE WATER	MUNICIPAL WATER SUPPLY
Arsenic	ND	ND
Cadmium	ND	NA
Chromium	ND - 0.008	ND - 0.005
Copper	ND - 0.006	ND - 0.014
Lead	ND	ND - 0.011
Zinc	ND - 0.050	ND - 0.093
Benzene	NA	NA
PAHs (High MW)	ND - 2.3 E-4 d	ND - 9.0 E-6
PAHs (Low MW)	ND - 5.1 E-5	ND - 8.7 E-5
PAHs (Total)	See Above	See Above

PARAMETER	SLOUGH WATER	SUBSURFACE SOIL
Arsenic	ND	1.0 - 4.3
Cadmium	ND	NA
Chromium	ND - 0.002	7.7 - 15.0
Copper	ND	4.2 - 14.0
Lead	ND	3.2 - 9.4
Zinc	0.013 - 1.1	32 - 150
Benzene	NA	NA
PAHs (High MW)	ND	See Total
PAHs (Low MW)	ND	See Total
PAHs (Total)	ND	ND

Table Continued --

TABLE 2
Continued

POTENTIALLY SIGNIFICANT OFF-SITE CONTAMINANTS

PARAMETER	SUBSURFACE SOILS AND SEDIMENT SHORELINE/WATERFOWL AREA	SEDIMENT LAKE
Arsenic	0.8 - 4.5	4.5 - 7.8
Cadmium	NA	NA
Chromium	9.2 - 19.0	9.2 - 24.0
Copper	7.9 - 19.0	3.9 - 31.0
Lead	6.2 - 15.0	4.5 - 18.0
Zinc	39 - 110	43 - 140
Benzene	NA	NA
PAHs (High MW)	ND - 12.4	ND
PAHs (Low MW)	7.7 - 403	ND
PAHs (Total)	See Above	ND

PARAMETER	SEDIMENT SLOUGH	FISH FILLET
Arsenic	6.2 - 26.0	ND
Cadmium	NA	NA
Chromium	15.0 - 32.0	ND - 0.57
Copper	9.9 - 14.0	0.39 - 1.0
Lead	15.0 - 21.0	ND
Zinc	29 - 8750	3.4 - 9.0
Benzene	NA	ND
PAHs (High MW)	ND - 132	ND c
PAHs (Low MW)	ND - 210 b	ND c
PAHs (Total)	ND - 342	ND
Selenium	NA	0.2 - 0.34

All values are in ppm
Samples taken 1984/85/86/87/88

NA = no analysis
ND = not detected
* = only one value reported
** = residual values remaining after emergency removal
a = maximum value
b = estimated maximum value
c = detection limit 0.5 ppm
d = only value above detection limit; also detected in shipping blank; therefore value likely due to outside source of contamination
MW = molecular weight

TABLE 3

POTENTIAL HUMAN EXPOSURE PATHWAYS

MEDIA	POTENTIAL EXPOSURE POINTS	EXPOSURE ROUTES OF CONCERN [Y/N][E]
SOIL	ON-SITE * Intruder, future workers	Y * Ingestion, dermal contact, and inhalation are probable
	OFF-SITE * Residents or other persons near site, lake shoreline, slough shoreline, swamp, pasture	Y * Ingestion, dermal contact, and inhalation are possible * Indirect exposure is possible through ingesting garden vegetables near the site that possibly contain contaminants taken up from soil (or contaminated groundwater) or that form a coating on the produce * Indirect exposure also would be possible, if cattle again graze near the site, through consumption of beef or milk that could possibly contain contaminants taken up from plants or soil or surface water
GROUND WATER	ON-SITE * No current exposure (no water-supply wells)	N * Not a current environmental pathway; no current or likely future exposure routes (public water available, so future well installation unlikely)
	OFF-SITE * Domestic well users (public water supply provided to all residences, etc., in immediate area)	Y * Ingestion of water is occurring at Somer School and may be used elsewhere for cooking; ingestion through irrigated food is possible; inhalation and dermal contact through nonconsumptive household uses (e.g., bathing and showering) possibly occurs (source of contaminants detected in the off-site wells is not confirmed)
SURFACE WATER	ON-SITE * No current exposure (CERCLA pond and swamp pond are typically dry)	N * Not a current environmental pathway: no current or likely future exposure routes.
	OFF-SITE * User of wildlife that may frequent site, fish, waterfowl	Y * Ingestion is probable
	* User of lake water (public water supply)	Y * Ingestion, inhalation, and dermal contact is occurring (source of contaminants is not confirmed)

Table Continued --

TABLE 3
(Continued)

MEDIA	POTENTIAL EXPOSURE POINTS	EXPOSURE ROUTES OF CONCERN [Y/N][E]
	* User of lake or slough water (swimming)	Y * Ingestion, inhalation, and dermal contact are possible
	* Slough, swamp pond and ditch area (waterfowl hunters) (No current exposure)	N * No likely exposure (not expect hunters because of proximity to residences and lack of access to private property)
SEDIMENT	ON-SITE * Intruder into CERCLA pond, remedial worker	Y * Ingestion, dermal contact possibly of concern
	*. Hunters around ditch and swamp pond (no likely current exposure)	N *. No likely significant exposure (not expect hunters because of proximity to residences and lack of access to private property)
	OFF-SITE * Beach user	Y * Ingestion, dermal contact possibly of concern
	* Hunters in vicinity of swamp pond or ditch (no likely current exposure)	N * No likely significant exposure (not expect hunters because of proximity to residences and lack of access to private property)
AIR	Exposure points integrated with discussion of other media	Exposure routes integrated with discussion of other media
FOOD CHAIN	Exposure points integrated with discussion of other media	Exposure routes integrated with discussion of other media

Note[E]: Y = Route of concern, N = Route not of concern